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LISTS OF SPECIES

# Helminths of freshwater fishes in the reservoir of the Hydroelectric Power Station of Itaipu, Paraná, Brazil

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**ABSTRACT:** This study presents results from several expeditions in 1985, 1991-1995 and 2003 to the Medium Paraná River in the section that begins below the Itaipu Dam and ends at the trinational border of Brazil, Argentina and Paraguay, in the lotic and lentic zones of the reservoir of the Hydroelectric Power Station of "Itaipu Binacional" (localities Foz do Iguaçu, Santa Helena and Guaira). Ninety-eight species of freshwater fishes belonging to 22 families were examined for helminths. A host-parasite list based on Acanthocephala, Cestoda, Digenea, Monogenea and Nematoda collected from the region in question is provided. New host records are presented for Digenea and Nematoda. The Monogenea and Acanthocephala are being studied and will be published in a later paper, but are referred in the host-parasite list, in order to demonstrate the parasitism in the fishes of the reservoir. The results are compared with those presented by other authors from the Upper Paraná River.

## INTRODUCTION

The Paraná River, the tenth longest river in the world, is a river in south-central South America, running through Brazil, Paraguay and Argentina. Together with its tributaries, it forms the larger of the two river systems that drain into the La Plata River, making it the second largest river system in South America, outranked only by the Amazon River. Along the course of the Paraná is the Itaipu Dam, the largest hydroelectric power station in the world, which creates a massive, deep reservoir behind it. Itaipu Binacional is a binational company undertaking run by Brazil and Paraguay at the Paraná River on the border section between the two countries.

Fish parasites in the Medium Paraná River basin have remained little known to date. This study reports results from several expeditions in 1985, 1991-1995 and 2003 to the Medium Paraná River in the section that begins below the Itaipu Dam and ends at the trinational border of Brazil, Argentina and Paraguay, and in the reservoir of the Hydroelectric Power Station of Itaipu Binacional, in the localities of Foz do Iguaçu (lentic zone, next to the dam at the end of the reservoir), Santa Helena (transition zone in the middle of the reservoir) and Guaira (lotic zone at the beginning of the reservoir) (Figure 1). A host–parasite list is presented in Table 1. The results were compared with those obtained by other authors in the floodplain of the Upper Paraná River and recently published in a checklist by Takemoto *et al.* (2009).

## MATERIALS AND METHODS

A total of 1,142 freshwater fish specimens belonging to 98 species and 22 families were examined for helminths. These were caught using gill nets in the Medium Paraná River in the localities of Foz do Iguaçu (25°32'52"

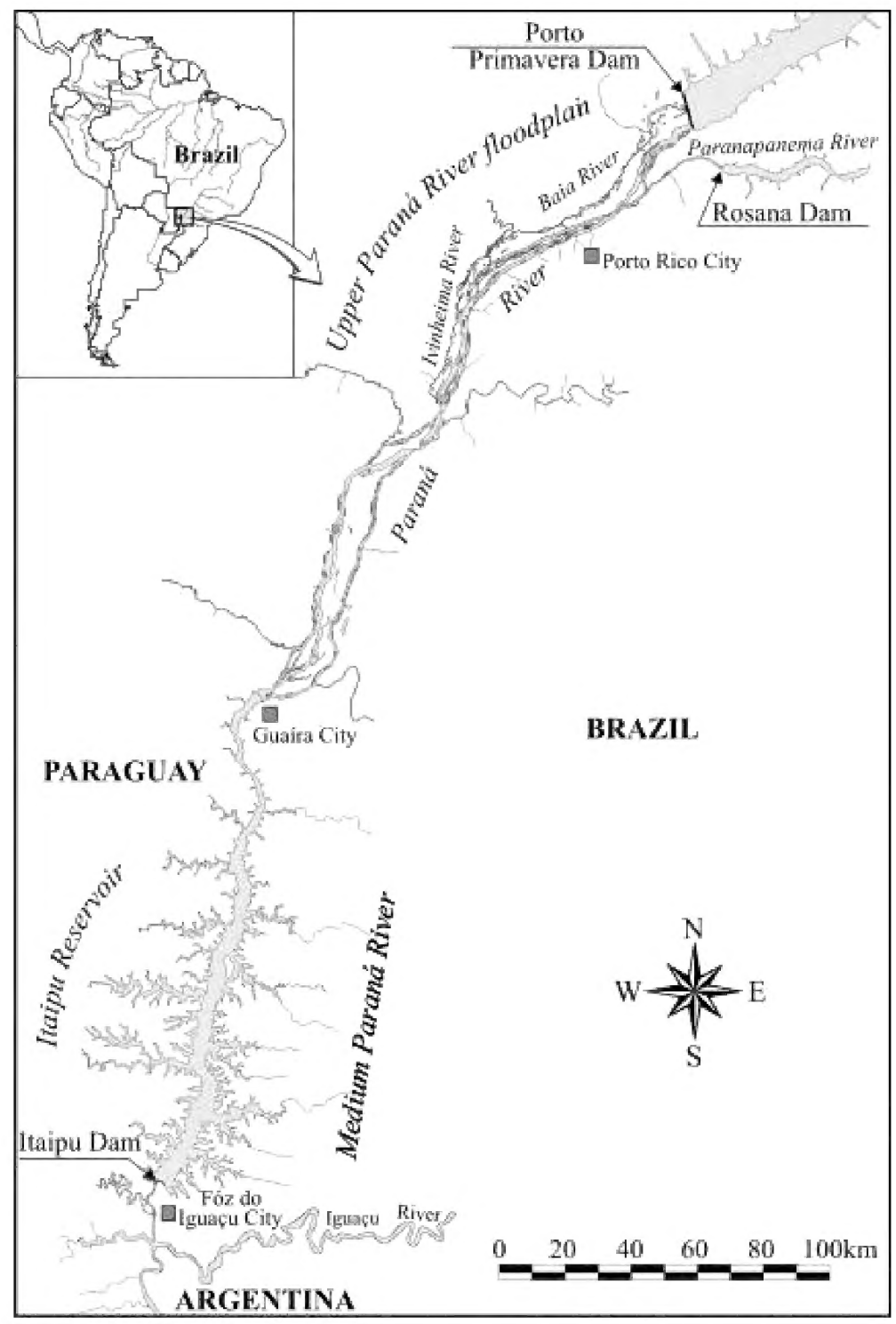


**FIGURE 1.** Location of the Medium Paraná River with the reservoir of the Hydroelectric Power Station of Itaipu and Upper Paraná River floodplain, Brazil.

N, 54°35'17" W), lentic zone, at the end of the Itaipu reservoir of the Hydroelectric Power Station of Itaipu Binational, Paraná State, Brazil; Santa Helena (24°51'37" N, 54°19'58" W), transition zone, in the middle of the reservoir; and Guaira (24°04'48" N, 54°15'21" W), lotic zone, at the beginning of the reservoir. Parasites collected were processed in accordance with the methodology used for each group. The names of fishes accepted as valid follow the most recent bibliography (Froese and Pauly 2010; Graça and Pavanelli 2007) and sometimes do not correspond to the names of parasite references. Material studied was deposited in the Helminthological Collection of the Oswaldo Cruz Institute, Fiocruz, Rio de Janeiro, Brazil.

## Results and Discussion

Of the 98 fish species examined from the Medium Paraná River, lotic and lentic zones of the reservoir of the Hydroelectric Power Station of Itaipu, parasitism by helminths was verified in 78 species. Nematoda was the most prevalent group, identified in 63% of the fishes examined, followed by Digenea (47.4%), Monogenea (45.4%), Cestoda (19.5%) and Acanthocephala (14.4%).

Forty-eight species of Nematoda were recorded and nine of them were found in new hosts (Table 1): *Cucullanus* sp. (if), *Goezia* sp., *Ichthyouris laterifilamenta* Moravec, Kohn and Fernandes, 1992, *Paracamallanus amazonensis* Ferraz and Thatcher, 1992, *Procamallanus* (*Procamallanus*) *annipetterae* Kohn and Fernandes, 1988, *Procamallanus* (*Spirocamallanus*) *inopinatus* Travassos, Artigas and Pereira, 1928, *Procamallanus* (*Spirocamallanus*) sp., *Raphidascaris* (*Sprentascaris*) *mahnerti* (Petter and Cassone, 1984) and *Rondonia rondoni* Travassos, 1920 (if).

Thirty four species of Digenea were recovered, 11 of them in new hosts (Table 1): *Crassicutis cichlasomae* Manter, 1936, *Dadaytrema oxycephala* (Diesing, 1836), *Dendrorchis sp.*, *Genarchella astyanactis* (Watson, 1976), *Genarchella tropica* (Manter, 1936), *Magnivitellinum simplex* Kloss, 1966, *Paralecithobohtrys brasiliensis* Freitas, 1947, *Prosthenhystera obesa* (Diesing, 1850), *Saccocoelioides godoyi* Kohn and Fróes, 1986, *Saccocoelioides* m*agnus* Szidat, 1954 and *Saccocoelioides nanii* Szidat, 1954.

Eighteen species of Cestoda and ten of Acanthocephala were found in hosts already reported. Forty-four of the 98 species of fishes examined were parasitized with Monogenea and will be published in a later paper. The species of Acanthocephala referred herein were subject of a master thesis and are referred in another paper (Lopes *et a*l. 2011).

Some morphological and taxonomical data based on these materials have already been published by Baptista-Farias *et al.* (2001), Cohen and Kohn (2008a, b), Cohen and Kohn (2009) Cohen *et al.* (2001), Fernandes and Kohn (2001), Kohn and Fernandes (1994; 2006), Kohn *et al.* (1995; 1999; 2000; 2003), Lopes *et al*. (2011) and Moravec *et al.* (1990; 1992a, b, c;1993 a, b, c; 1994 a, b; 1997).

The Medium Paraná River underwent a great impact when changing from a lotic to a lentic environment. In addition, the natural barrier known *as* Sete Quedas was eliminated, because it was submerged in the reservoir when the Itaipu Dam was built. Thus, fish species that had only lived in Sete Quedas (Guaira) below were able to climb and explore a new environment.

The floodplain of the Upper Paraná River was considered the last free stretch of the Paraná River. However, it has undergone severe changes in its system of flood and drought, since hydroelectric plants were built upstream and now control the water level of the river. Considering these changes, all the fauna, including the parasites of fishes, may be affected. Oscillations in the hydrologic flow, such as occur in floodplains, may influence the occurrence and size of fish parasite infrapopulations (Dogiel 1970). All these observed impacts on the floodplain can directly and indirectly affect the parasitic fauna of fish. Endoparasites, which typically have a complex life cycle, can be affected by changes in environments where the intermediate hosts live. Some species of the organisms that can serve as intermediate hosts may be favored and others may even be eliminated from the environment. Ectoparasites, those which are in direct contact with the environment, suffer directly from the changes caused by these impacts.

In the Medium Paraná River, 78 fish species out of 98 examined were parasitized by helminths. Nematoda was the most prevalent group, present in 63% of the fishes examined, followed by Digenea (47.4%), Monogenea (45.4%), Cestoda (19.5%) and Acanthocephala (14.4%). Since 1986, in the floodplain of the Upper Paraná River, 72 fish species have been examined and 278 species of helminths were recorded as parasitizing these. Monogeneans were identified with the largest number of species (95), followed by Digenea (73), Nematoda (71), Cestoda (47) and Acanthocephala (18). A checklist of fish hosts and their parasites was published recently by Takemoto *et al.* (2009).

In general, nematodes exhibit a low degree of host specificity. According to Eiras *et al.* (2010), the nematode *Procamallanus* (*Spirocamallanus*) *inopinatus* has already been identified in 51 fish species in Brazil. In the Medium Paraná River, *P.* (*S.*) *inopinatus* confirmed a low degree of host specificity and was identified in 15 species of fish (*Astyanax bimaculatus bimaculatus*, *A. b. lacustris*, *Brycon orbignyanus*, *Catathyridium jenynsii*, *Crenicichla haroldoi*, *Leporellus vittatus*, *Leporinus copelandii*, *L. friderici*, *Pterodoras granulosus*, *Serrasalmus marginatus*, *S. spilopleura*, *Trachydoras paraguayensis*, *Trachelioptera galeatus*, *Pimelodus sp.* and *Potamotrygon motoro*). In the floodplain of the Upper Paraná River, this species was recorded in 10 host species (*Hoplias aff. malabaricus*, *Leporinus elongatus*, *L. obtusidens, L. lacustris*, *Metynnis lippincottianus*, *Pseudoplatystoma corruscans*, *Serrasalmus marginatus*, *S. maculatus*, *Schizodon borellii* and *Trachydoras paraguayensis*). Among all these species, only *S. marginatus* and *T. paraguayensis* were common in both environments studied.

Immature forms of nematodes of the family Anisakidae (*Contracaecum* sp., *Hysterothylacium* sp. and Anisakidae gen. sp.) were found in 24 fish species examined in the localities studied on the Medium Paraná River. In the floodplain of the Upper Paraná River, 17 hosts were reported to be parasitized by *Contracaecum* and/or *Hystherothylacium* larvae. Species of the Anisakidae deserve special attention; they parasitize fish as larvae, using them as intermediate or paratenic hosts and are

known to be agents of parasitoses in humans. However, to date, no reports of such zoonotic diseases have been made in the region. This is probably because the parasites are large and mainly parasitize the mesentery, which is not used as food by people.

Some species of Digenea also exhibit a low degree of host specificity. The metacercariae of *Austrodiplostomum compactum*, parasitic in the eyes of fish, were recorded for the first time in *Plagioscion squamosissimus* from the reservoir of the Hydroelectric Power Station of Itaipu by Kohn *et al.* (1995). In the floodplain, this larva was reported in the same host species by Pavanelli *et al.* (1997), as well as in some other host species: *Hoplias aff. malabaricus*, *Satanoperca pappaterra*, *Crenicichla britskii*, *Cichla kelberi* (= *Cichla monoculus*), *Cichlasoma paranaense* (Machado *et al.* 2005). Yamada *et al.* (2008) also reported it as parasitising *Hypostomus regani*, *Schizodon borellii*, *Serrasalmus marginatus* and *Auchenipterus osteomystax*. This parasite is very common in the "corvina" *P. squamosissimus*. Machado *et al.* (2005) reported a prevalence of 95% and recorded 397 parasites in one fish. Due to this high prevalence, this trematode species was probably introduced together with its definitive host. The prevalence was also relatively high in *S. pappaterra* (71.9%) and in *C. kelberi* (65%). This parasite is ecologically important since it lives in the eyes of fish, damaging their vision and making them susceptible to predators. Thus, the parasite can complete its life cycle.

Among the hosts examined, 47 helminth species were common in both sampling sites. However, fishes from the Upper Paraná River floodplain showed a greater species diversity of helminth parasites. This difference probably occurred because, despite all the above-mentioned changes that are occurring in the floodplain, all animals necessary for completing the life cycles of the respective helminths are present in this environment. In the Itaipu reservoir, the impact was greater following the impoundment and many organisms may have disappeared. Some of them may act as intermediate hosts of helminth parasites.

The differences in the taxonomic diversification of the parasite assemblages of different fish species were mainly related to the environment, trophic level and temperature (Luque and Poulin 2008). Therefore, the Upper Paraná River floodplain, characterized by the presence of a wide variety of habitats and species, favors the occurrence of a greater diversity of fish parasites.

**Table 1.** List of helminths of freshwater fishes recorded in reservoir of the Hydroelectric Power Station of Itaipu, Parana, Brazil. E/P = number of examined / parasitized hosts, I = number of infected hosts by each species, A = Acanthocephala, C = Cestoda, D = Digenea, M = Monogenea, N = Nematoda, if = immature form, mc = metacercariae.

| HOSTS | COMMON NAME | E/P | I | | HELMINTHS |
|---|---|---|---|---|---|
| **Acestrorhynchidae** | | | | | |
| *Acestrorhynchus lacustris* | peixe-cachorro | 11/6 | 1 | N | *Contracaecum* sp. (if) |
| | | | 4 | N | *Travassosnema travassosi paranaensis* Moravec, Kohn and Fernandes, 1993 |
| | | | 2 | D | *Rhipidocotyle gibsoni* Kohn and Fernandes, 1994 |
| | | | 3 | M | Monogenea gen. sp. |
| **Achiridae** | | | | | |
| *Catathyridium jenynsii* [= *Achirus jenynsii* ] | linguado | 19/4 | 3 | N | Anisakidae gen. sp. (if) |
| | | | 1 | N | *Procamallanus* (*Spirocamallanus*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | D | *Prosorhynchoides rioplatensis* (Szidat, 1970) |
| **Anostomidae** | | | | | |
| *Leporellus vittatus* | solteira | 11/4 | 2 | N | Anisakidae gen. sp. (if) |
| | | | 1 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 2 | M | Monogenea gen. sp. |
| *Leporinus copelandii* | piau | 9/5 | 4 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | A | Acanthocephala gen. sp. |
| *Leporinus elongatus* | piapara | 3/2 | 1 | D | *Genarchella astyanactis* (Watson, 1976) (new host record and first report in South America) |
| | | | 1 | D | *Saccocoelioides magnus* (Szidat, 1954) (new host record) |
| *Leporinus friderici* | piava | 15/12 | 9 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 2 | N | *Goezia* sp. |
| | | | 3 | D | *Saccocoelioides godoyi* Kohn and Fróes, 1986 |
| *Leporinus obtusidens* | piapara | 5/5 | 1 | D | Diplostomidae gen. sp. (mc) |
| | | | 3 | D | *Sanguinicola* sp. (referred as *Plehniella* sp. by Fernandes and Kohn, 2001) |
| | | | 1 | C | Cestoda gen. sp. |
| *Schizodon borellii* | piava | 9/2 | 1 | N | Anisakidae gen. sp. (if) |
| | | | 2 | M | Monogenea gen. sp. |
| *Schizodon fasciatus* | Piava | 5/5 | 1 | N | Capillariidae gen. sp. 1 of Moravec, Kohn and Fernandes, 1992 |
| | | | 2 | N | *Dichelyne leporini* Petter, 1989 |
| | | | 1 | N | *Procamallanus*(*S.*) *iheringi* Travassos, Artigas and Pereira, 1928 |
| | | | 4 | A | *Octospiniferoides incognita* Schmidt and Huggins, 1973 |
| *Schizodon knerii* | piava | 7/3 | 2 | N | *Chalcinotrema thatcheri* Kohn, Fernandes and Gibson, 1999 |

**TABLE 1.** ***CONTINUED.***

| HOSTS | COMMON NAME | E/P | I | | HELMINTHS |
|---|---|---|---|---|---|
| *Schizodon knerii* | piava | 7/3 | 1 | D | *Paralecithobothrys brasiliensis* Freitas, 1947 (new host record) |
| | | | 2 | D | *Saccocoelioides magnus* Szidat, 1954 (new host record) |
| | | | 2 | A | Acanthocephala gen. sp. |
| | | | 1 | M | Monogenea gen. sp. |
| **Auchenipteridae** | | | | | |
| *Ageneiosus militaris* [=*Ageneiosus valenciennesi*] | manduvê, bagre | 10/4 | 2 | N | *Cucullanus* (*Cucullanus*) *pinnai pinnai* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | N | *Goezia* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | D | Clinostomidae (mc) |
| *Auchenipterus osteomystax* (referred as *Auchenipterus nuchalis* by Moravec, Kohn and Fernandes, 1993) | surumanha | 68/16 | 6 | N | *Cucullanus brevispiculus* Moravec, Kohn and Fernandes, 1993 |
| | | | 4 | D | *Microrchis oligovitellum* Lunaschi, 1987 |
| | | | 9 | M | Monogenea gen.sp. |
| *Trachelyopterus galeatus* [= *Parauchenipterus galeatus*] | cangati | 24/12 | 1 | N | *Contracaecum* sp. 2 (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Goezia* sp. (if) |
| | | | 1 | N | *Procamallanus (S.) inopinatus* Travassos, Artigas and Pereira, 1928 (new host record) |
| | | | 8 | D | *Microrchis oligovitellum* Lunaschi, 1987 |
| | | | 1 | C | *Cangatiella arandasi* Pavanelli and Machado, 1991 |
| | | | 5 | M | Monogenea gen. sp. |
| **Characidae** | | | | | |
| *Astyanax bimaculatus bimaculatus* [=*Astyanax bimaculatus*] | tambiú | 31/12 | 1 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 4 | D | *Magnivitellinum simplex* Kloss, 1966 |
| | | | 8 | M | Monogenea gen. sp. |
| *Astyanax bimaculatus lacustris* | tambiú | 19/4 | 1 | N | *Cosmoxynemoides aguirrei* Travassos, 1949 |
| | | | 1 | N | *Procamallanus (S.) inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | N | *Travnema travnema* Pereira, 1938 |
| | | | 3 | M | Monogenea gen. sp. |
| *Astyanax eigenmanniorum* | tambiú, lambari | 11/3 | 3 | N | *Travnema* sp. |
| *Brycon hilarii* | piracanjuba | 7/2 | 1 | N | Anisakidae gen. sp. |
| | | | 1 | N | *Goezia brasiliensis* Moravec, Kohn and Fernandes, 1994 |
| | | | 1 | N | *Goezia brevicaeca* Moravec, Kohn and Fernandes, 1994 |
| *Brycon orbignyanus* | Piracanjuba, matrinchão | 12/4 | 2 | N | *Goezia* sp. (new host record) |
| | | | 2 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 (new host record) |
| | | | 1 | M | Monogenea gen. sp. |
| *Cynopotamus kincaidi* | peixe-cachorro, saicanga | 8/6 | 4 | N | Anisakidae gen. sp. (if) |
| | | | 1 | N | *Procamallanus* (*S.*) sp. (new host record) |
| | | | 1 | D | *Prosthenhystera obesa* (Diesing, 1850) (new host record) |
| | | | 2 | M | Monogenea gen. sp. |
| *Galeocharax humeralis* | cigarra | 5/2 | 1 | N | *Contracaecum* sp. 1 (if) of Moravec, Kohn and Fernandes, 1993 |
| *Galeocharax knerii* | Cigarra, cadela | 24/4 | 2 | N | *Contracaecum* sp. 1 (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Hysterothylacium* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 2 | C | Cestoda gen. sp. (if) |
| *Piaractus mesopotamicus* | pacu | 29/26 | 2 | N | *Goezia* sp. (if) |
| | | | 1 | N | *Rondonia rondoni* Travassos, 1920 |
| | | | 1 | N | *Spectatus* sp. (juvenile female) of Moravec, Kohn and Fernandes, 1997 |
| | | | 2 | D | *Curumai curumai* Travassos, 1961 |
| | | | 3 | D | *Dadaytrema oxycephala* (Diesing, 1836) |
| | | | 1 | C | Cestoda gen. sp. |
| | | | 23 | M | Monogenea gen.sp. |
| *Roeboides paranensis* | dentudo | 36/21 | 12 | D | *Magnivitellinum simplex* Kloss, 1966 (new host record) |
| | | | 7 | M | Monogenea gen. sp. |
| *Salminus brasiliensis* [=*Salminus maxillosus*] | dourado | 26/21 | 1 | N | Acuariinae gen. sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 9 | N | *Hysterothylacium* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Paracapillaria piscicola* (Travassos, Artigas and Pereira, 1928) |

**TABLE 1.** ***CONTINUED.***

| HOSTS | COMMON NAME | E/P | I | | HELMINTHS |
|---|---|---|---|---|---|
| *Salminus brasiliensis* [=*Salminus maxillosus*] | dourado | 26/21 | 13 | D | *Neocladocystis intestinalis* (Vaz, 1932) |
| | | | 2 | D | *Prosthenhystera obesa* (Diesing, 1850) |
| | | | 9 | D | *Rhipidocotyle jeffersoni* (Kohn, 1970) |
| | | | 1 | D | *Thometrema overstreeti* (Brooks, Mayes and Thorson,1979) |
| | | | 6 | C | Cestoda gen. sp. (if) |
| | | | 12 | M | Monogenea gen. sp. |
| *Serrasalmus marginatus* | piranha | 58/17 | 1 | N | *Contracaecum* sp. (if) |
| | | | 1 | N | *Cucullanus* sp. 3 of Moravec, Kohn and Fernandes, 1993 |
| | | | 4 | N | *Goezia* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 3 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 7 | M | Monogenea gen. sp. |
| *Serrasalmus spilopleura* | piranha | 12/6 | 3 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 3 | M | Monogenea gen. sp. |
| *Triportheus angulatus* | sardinha | 6/4 | 2 | N | Anisakidae gen. sp. (if) |
| | | | 1 | N | *Procamallanus* (*S.*) sp. |
| | | | 3 | M | Monogenea gen. sp. |
| *Cichla monoculus* | tucunaré | 7/6 | 1 | N | Anisakidae gen. sp. (if) |
| | | | 2 | N | *Procamallanus* (*Procamallanus*) *peraccuratus* Pinto, Fábio, Noronha and Rolas, 1976 |
| | | | 1 | D | Diplostomidae gen. sp. (mc) |
| | | | 3 | C | *Proteocephalus macrophallus* (Diesing, 1850) |
| | | | 4 | C | *Proteocephalus microscopicus* (Woodland, 1935) |
| *Crenicichla haroldoi* | joaninha | 1/1 | 1 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | C | Cestoda gen. sp. (if) |
| *Crenicichla niederleini* [referred as *C. lepidota* by Moravec, Kohn and Fernandes, 1993] | joaninha | 47/44 | 1 | N | *Contracaecum* sp. 1 (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 2 | N | *Hysterothylacium* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 34 | N | *Procamallanus* (*P.*) *peraccuratus* Pinto, Fábio, Noronha and Rolas, 1976 |
| | | | 3 | D | *Crassicutis cichlasomae* Manter, 1936 (new host record) |
| | | | 18 | D | Diplostomidae gen. sp. (mc) |
| | | | 8 | D | *Neascus* sp. (mc) |
| | | | 9 | M | Monogenea gen. sp. |
| *Geophagus brasiliensis* | cará | 18/11 | 2 | N | *Hysterothylacium* gen. sp. (if) |
| | | | 2 | N | *Procamallanus* (*P.*) *peraccuratus* Pinto, Fábio, Noronha and Rolas, 1976 |
| | | | 1 | N | *Procamallanus* (*S.*) sp. |
| | | | 1 | N | *Raphidascaris* (*Sprentascaris*) sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 5 | D | *Crassicutis cichlasomae* Manter, 1936 |
| | | | 2 | D | Diplostomidade gen. sp. (mc) |
| | | | 2 | M | Monogenea gen. sp. |
| **Curimatidae** | | | | | |
| *Cyphocharax gilbert* [=*Pseudocurimata gilberti*] | saguiru | 5/5 | 2 | N | *Cosmoxynema vianai* Travassos, 1949 |
| | | | 1 | N | *Cosmoxynemoides aguirrei* Travassos, 1949 |
| | | | 1 | N | *Guyanema* sp. of Moravec, Kohn and Fernandes, 1993 |
| | | | 2 | N | *Travnema araujoi* Fernandes, Campos and Artigas, 1983 |
| | | | 1 | D | *Zonocotyle bicaecata* Travassos, 1948 |
| | | | 1 | M | Monogenea gen. sp. |
| *Cyphocharax nagelii* | saguiru | 3/3 | 1 | N | *Cosmoxynemoides* sp. |
| | | | 2 | D | Diplostomidae gen. sp. (mc) |
| | | | 2 | D | *Saccocoelioides godoyi* Kohn and Fróes, 1986 (new host record) |
| *Potamorhina squamoralevis* | saguiru, papa-terra | 5/4 | 1 | N | *Ichthyouris laterifilamenta* Moravec, Kohn and Fernandes, 1992 (new host record) |
| | | | 3 | M | Monogenea gen. sp. |
| *Satanoperca pappaterra* | cará | 9/3 | 1 | C | Cyclophillidae gen. sp. |
| | | | 2 | M | Monogenea gen. sp. |
| *Steindachnerina elegans* [=*Pseudocurimata elegans*] | saguiru | 5/2 | 1 | N | *Cosmoxynemoides aguirrei* Travassos, 1949 |
| | | | 1 | N | *Travnema travnema* Pereira, 1938 |

**TABLE 1.** ***CONTINUED.***

| HOSTS | COMMON NAME | E/P | I | | HELMINTHS |
|---|---|---|---|---|---|
| *Steindachnerina elegans* [=*Pseudocurimata elegans*] | saguiru | 5/2 | 1 | A | Acanthocephala gen. sp. |
| *Steindachnerina insculpta* | saguiru | 3/2 | 2 | D | Diplostomidade gen.sp (mc) |
| **Cynodontidae** | | | | | |
| *Rhaphiodon vulpinus* | peixe-cadela, dourado- cachorro | 48/31 | 3 | N | *Contracaecum* sp. 1 (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Contracaecum* sp. 2 (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Cucullanus* sp. (if) (new host record) |
| | | | 1 | N | *Goezia* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 2 | N | *Guyanema raphiodoni* Moravec, Kohn and Fernandes, 1993 |
| | | | 16 | N | *Hysterothylacium* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Rondonia rondoni* Travassos, 1920 (if) (new host record) |
| | | | 1 | D | *Saccocoelioides nanii* Szidat, 1954 (new host record) |
| | | | 16 | M | Monogenea gen.sp. |
| **Doradidae** | | | | | |
| *Oxydoras knerii* | armado, abotoado | 3/1 | 1 | A | *Paracavisoma impudica* (Diesing, 1851) |
| | | | 2 | N | *Cucullanus pinnai pterodorasi* Moravec, Kohn and Fernandes, 1992 |
| *Pterodoras granulosus* | armado, abotoado | 25/22 | 1 | N | *Goezia* sp. |
| | | | 1 | N | *Hysterothylacium* sp.(if) |
| | | | 2 | N | *Neoparaseuratum travassosi* Moravec, Kohn and Fernandes, 1992 |
| | | | 2 | N | *Paracamallanus amazonensis* Ferraz and Thatcher, 1992 |
| | | | 3 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 14 | N | *Rondonia rondoni* Travassos, 1920 |
| | | | 3 | D | *Curumai curumai* Travassos, 1961 |
| | | | 6 | D | *Dadaytrema oxycephala* (Diesing, 1836) |
| | | | 3 | C | *Monticellia belavistensis* Pavanelli, Machado, Takemoto, Massado and Santos, 1994 |
| | | | 12 | M | Monogenea gen. sp. |
| *Trachydoras paraguayensis* | armadinho | 21/19 | 12 | N | *Ichthyouris laterifilamenta* Moravec, Kohn and Fernandes, 1992 |
| | | | 10 | N | *Neoparaseuratum travassosi* Moravec, Kohn and Fernandes, 1992 |
| | | | 1 | N | *Parasynodontisia petterae* Moravec, Kohn and Fernandes, 1992 |
| | | | 15 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 3 | N | *Rondonia rondoni* Travassos, 1920 |
| | | | 1 | M | Monogenea gen. sp. |
| **Erythrinidae** | | | | | |
| *Hoplias malabaricus* | traíra | 20/10 | 1 | N | *Contracaecum* sp. 1 (if) |
| | | | 1 | N | *Guyanema raphiodoni* Moravec, Kohn and Fernandes, 1993 |
| | | | 3 | D | Diplostomidae gen. sp. (mc) |
| | | | 1 | D | *Pseudosellacotyla lutzi* (Freitas, 1941) |
| | | | 1 | M | Monogenea gen. sp. |
| **Heptapteridae** | | | | | |
| *Pimelodella gracilis* | mandi, roncador | 5/3 | 1 | N | *Hysterothylacium* sp. (if) |
| | | | 1 | N | *Cucullanus* (*C.*) *pinnai pinnai* Travassos, Artigas and Pereira, 1928 |
| | | | 2 | N | *Rondonia rondoni* Travassos, 1920 (new host record) |
| | | | 1 | C | Cestoda gen. sp. |
| | | | 1 | M | Monogenea gen. sp. |
| *Pimelodella lateristriga* | mandi-chorão, mandi-roncador | 2/2 | 2 | N | *Brasilnema pimelodellae* Moravec, Kohn and Fernandes, 1992 |
| | | | 1 | N | *Cucullanus pimelodellae* Moravec, Kohn and Fernandes, 1993 |
| | | | 2 | N | *Procamallanus* (*Spirocamallanus*) *pimelodus* Pinto, Fábio, Noronha and Rolas, 1974 |
| | | | 1 | D | *Parspina argentinensis* (Szidat, 1954) |
| | | | 1 | C | Cestoda gen. sp. |
| *Rhamdia quelen* | bagre | 1/1 | 1 | D | *Acanthostomum gnerii* Szidat, 1954 |
| | | | 1 | M | Monogenea gen. sp. |
| **Loricariidae** | | | | | |
| *Hypostomus* aff. *albopunctatus* | cascudo-viola, cascudo-ferro | 1/1 | 1 | M | Monogenea gen.sp. |
| *Hypostomus cochliodon* | cascudo | 2/2 | 2 | A | Acanthocephala gen. sp. |

**TABLE 1.** ***CONTINUED.***

| HOSTS | COMMON NAME | E/P | I | | HELMINTHS |
|---|---|---|---|---|---|
| *Hypostomus regani* [= *Plecostomus regani*] | cascudo | 11/9 | 1 | N | Nematoda gen. sp. |
| | | | 2 | N | *Procamallanus* (*Procamallanus*) *annipetterae* Kohn and Fernandes, 1988 |
| | | | 3 | D | *Crassicutis intermedius* (Szidat, 1954) |
| | | | 2 | A | Acanthocephala gen. sp. |
| | | | 6 | M | Monogenea gen.sp. |
| *Hypostomus ternetzi* | cascudo | 4/1 | 1 | M | Monogenea gen.sp. |
| *Hypostomus* sp. 1 | cascudo-pintado | 7/1 | 1 | M | Monogenea gen.sp. |
| *Hypostomus* sp. 2 | cascudo | 30/11 | 2 | N | *Procamallanus* (*P.*) *annipetterae* Kohn and Fernandes, 1988 |
| | | | 1 | N | *Raphidascaris* (*Sprentascaris*) *hypostomi* (Petter and Cassone, 1984) |
| | | | 3 | D | *Crassicutis intermedius* (Szidat, 1954) |
| | | | 1 | D | Diplostomidae gen. sp. (mc) |
| | | | 2 | A | *Gorytocephalus* sp |
| *Loricaria* sp. | cascudo | 4/3 | 1 | N | Anisakidae gen. sp. (if) |
| | | | 1 | N | *Cucullanus* (*C.*) *pinnai pinnai* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | N | *Raphidascaris* (*S.*) *mahnerti* (Petter and Cassone, 1984) |
| | | | 2 | D | *Crassicutis cichlasomae* Manter, 1936 (new host record) |
| | | | 1 | D | Diplostomidae gen. sp. (mc) |
| | | | 1 | A | Acanthocephala gen. sp. |
| | | | 2 | M | Monogenea gen. sp. |
| *Loricariichthys platymetopon* | cascudo-chinelo | 8/8 | 7 | N | *Raphidascaris* (*S.*) *mahnerti* (Petter and Cassone, 1984) |
| | | | 2 | D | Diplostomidae gen. sp. (mc) |
| | | | 1 | M | Monogenea gen.sp. |
| *Loricariichthys rostratus* | cascudo-chinelo | 7/6 | 4 | N | *Raphidascaris* (*S.*) *mahnerti* (Petter and Cassone, 1984) (new host record) |
| | | | 1 | D | Diplostomidae gen. sp. (mc) |
| *Loricariichthys* sp. | cascudo | 25/21 | 1 | N | *Hysterothylacium* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 22 | N | *Raphidascaris* (*S.*) *mahnerti* (Petter and Cassone, 1984) |
| | | | 4 | D | Diplostomidae gen. sp. (mc) |
| | | | 2 | C | Cestoda gen. sp. (if) |
| *Megalancistrus parananus* [=*Megalancistrus aculeatus; Pterygoplichthys aculeatus]* | cascudo-abacaxi | 11/8 | 7 | N | *Ichthyouris brasiliensis* Moravec, Kohn and Fernandes, 1992 |
| | | | 3 | N | *Procamallanus* (*P.*) *annipetterae* Kohn and Fernandes, 1988 (new host record) |
| | | | 1 | D | *Dadaytrema* sp. |
| | | | 1 | D | *Genarchella tropica* (Manter, 1936) (new host record and first report in South America) |
| | | | 4 | D | *Saccocoelioides magnus* Szidat, 1954 (new host record) |
| *Pseudohemiodon laticeps* [=*Loricaria laticeps*] | cascudo-chicote | 2/2 | 2 | N | *Raphidascaris* (*S.*) *mahnerti* (Petter and Cassone, 1984) |
| | | | 1 | D | Diplostomidae gen. sp. (mc) |
| *Pterygoplichthys* sp. | cascudo-pintado | 1/1 | 1 | D | *Dendrorchis* sp. (new host record) |
| *Rhinelepis strigosa* [=*Rhinelepis aspera* ] | cascudo-preto | 6/3 | 1 | N | *Parasynodontisia petterae* Moravec, Kohn and Fernandes, 1992 |
| | | | 1 | M | Monogenea gen.sp. |
| **Parodontidae** | | | | | |
| *Apareiodon affinis* | canivete | 18/1 | 1 | M | Monogenea gen. sp. |
| **Pimelodidae** | | | | | |
| *Bergiaria westermanni* | mandi-beiçudo | 5/3 | 2 | A | Acanthocephala gen. sp. |
| *Hemisorubim platyrhynchos* | jurupoca, jeripoca | 5/4 | 1 | D | *Sanguinicola* sp. (as *Pleniella* sp. by Fernandes and Kohn, 2001) |
| | | | 3 | C | Cestoda gen. sp. |
| | | | 1 | M | Monogenea gen. sp. |
| *Hypophthalmus edentatus* | mapará | 19/13 | 8 | N | *Hysterothylacium* sp. (if) |
| | | | 9 | N | *Paracamallanus amazonensis* Ferraz and Thatcher, 1992 |
| | | | 1 | M | Monogenea gen. sp. |
| *Iheringichthys labrosus* | mandi | 19/11 | 1 | N | *Goezia* sp. |
| | | | 5 | N | *Procamallanus* (*S.*) *pimelodus* Pinto, Fábio, Noronha and Rolas, 1974 |
| | | | 2 | D | *Auriculostoma platense* (Szidat, 1954) |
| | | | 2 | D | *Parspina* sp. |
| | | | 4 | M | Monogenea gen.sp. |

**TABLE 1.** ***CONTINUED.***

| HOSTS | COMMON NAME | E/P | I | | HELMINTHS |
|---|---|---|---|---|---|
| *Megalonema platanum* | pati, bagre | 4/2 | 1 | N | *Hysterothylacium* sp. (if) |
| | | | 1 | D | *Genarchella* sp. |
| *Pimelodus maculatus* | mandi | 29/18 | 7 | N | *Cucullanus* (*C.*) *pinnai pinnai* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | N | *Dichelyne pimelodi* Moravec, Kohn and Fernandes, 1997 |
| | | | 2 | N | *Procamallanus* (*S.*) *pimelodus* Pinto, Fábio, Noronha and Rolas, 1974 |
| | | | 3 | D | *Auriculostoma platense* (Szidat, 1954) |
| | | | 1 | C | *Monticellia magna* (Rego, Santos and Silva, 1974) |
| | | | 5 | A | *Neoechinorhynchus* sp. |
| | | | 6 | M | Monogenea gen.sp. |
| *Pimelodus ornatus* | mandi | 2/2 | 2 | N | *Cucullanus* (*C.*) *pinnai pinnai* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | D | *Genarchella genarchella* Travassos, Artigas and Pereira, 1928 |
| *Pimelodus* sp. | mandi | 40/23 | 2 | N | *Cucullanus* (*C.*) *pinnai pinnai* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | N | *Raphidascaris* (*S.*) sp. |
| | | | 1 | N | *Raphidascaris* (*S.*) sp. (if) |
| | | | 1 | N | *Rondonia rondoni* Travassos, 1920 |
| | | | 2 | D | *Auriculostoma platense* (Szidat, 1954) |
| | | | 4 | D | Diplostomidae gen. sp. |
| | | | 1 | A | Acanthocephala gen. sp. |
| | | | 10 | M | Monogenea gen.sp. |
| *Pinirampus pirinampu* | barbado | 17/10 | 1 | N | Oxyuroidea gen.sp. |
| | | | 9 | C | *Rudolphiella piranabu* (Woodland, 1934) |
| *Pseudopimelodus mangurus* [=*Pseudopimelodus roosevelti*] | jaú-sapo, bagre-sapo | 2/1 | 1 | D | *Iheringtrema iheringi* Travassos, 1948 |
| *Pseudoplatystoma corruscans* | pintado, sorubim | 7/7 | 1 | N | Capillariidae gen. sp. 2 of Moravec, Kohn and Fernandes, 1993 |
| | | | 2 | N | *Contracaecum* sp. 2 (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 4 | N | *Cucullanus pseudoplatystomae* Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Goezia brasiliensis* Moravec, Kohn and Fernandes, 1994 |
| | | | 1 | D | *Clinostomum marginatum* (Rudolphi, 1819) (if) |
| | | | 1 | D | *Dadaytrema oxycephala* (Diesing, 1836) (new host record) |
| | | | 1 | D | Diplostomidae sp. (mc) |
| | | | 1 | C | *Choanoscolex abscissus* (Riggenbach, 1895) |
| | | | 1 | C | *Harriscolex kaparari* (Woodland, 1935) |
| | | | 1 | C | *Spasskyelina spinulifera* (Woodland, 1935) |
| | | | 1 | M | Monogenea gen. sp. |
| *Sorubim lima* | mandi-chinelo, chinelo, jurupoca | 5/4 | 1 | D | *Sanguinicola* sp. |
| | | | 1 | C | *Goezeela nupeliensis* Pavanelli and Rego, 1991 |
| | | | 1 | C | *Manaosia bracodemoca* Woodland, 1935 |
| | | | 3 | C | *Paramonticellia itaipuensis* Pavanelli and Rego, 1991 |
| *Zungaro zungaro* [=*Pseudopimelodus zungaro*; *Paulicea luetkeni*] | bagre-sapo, jaú | 6/4 | 2 | N | *Cucullanus (C.) pinnai pinnai* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | N | *Cucullanus* (*Cucullanus*) *zungaro* Vaz and Pereira, 1934 |
| | | | 1 | N | Seuratoidea gen.sp. (if) |
| | | | 1 | D | *Iheringtrema iheringi* Travassos, 1948 |
| | | | 2 | C | *Goezeella agostinhoi* Pavanelli and Santos, 1992 |
| | | | 1 | C | *Megathylacus brooksi* Rego and Pavanelli, 1985 |
| | | | 1 | C | *Peltidocotyle rugosa* Diesing, 1850 |
| | | | 1 | C | *Travassiella avitellina* Rego and Pavanelli, 1987 |
| **Potamotrygonidae** | | | | | |
| *Potamotrygon motoro* | raia | 5/3 | 1 | N | *Procamallanus* (*P.*) *peraccuratus* Pinto, Fábio, Noronha and Rolas, 1976 |
| | | | 1 | N | *Procamallanus* (*S.*) *inopinatus* Travassos, Artigas and Pereira, 1928 |
| | | | 1 | D | *Genarchella tropica* (Manter, 1936) (new host record and first report in South America) |
| | | | 3 | C | Cestoda gen. sp. |
| | | | 1 | M | Monogenea gen.sp. |
| **Prochilodontidae** | | | | | |
| *Prochilodus lineatus* [=*Prochilodus scrofa*] | curimbatá | 45/22 | 1 | N | *Contracaecum* sp. 2 (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Spinitectus asperus* Travassos, Artigas and Pereira, 1928 |

**TABLE 1.** ***CONTINUED.***

| HOSTS | COMMON NAME | E/P | I | | HELMINTHS |
|---|---|---|---|---|---|
| *Prochilodus lineatus* [=*Prochilodus scrofa*] | curimbatá | 45/22 | 10 | D | *Saccocoelioides nanii* Szidat, 1954 |
| | | | 10 | D | *Saccocoelioides elongatus* Szidat, 1954 |
| | | | 10 | A | *Neoechinorhynchus (Neoechinorhynchus) curemai* Noronha, 1973 |
| | | | 1 | M | Monogenea gen. sp. |
| **Rhamphichthyidae** | | | | | |
| *Rhamphichthys rostratus* | peixe-espada | 1/1 | 1 | N | *Cucullanus rhamphichthydis* Moravec, Kohn and Fernandes, 1997 |
| **Sciaenidae** | | | | | |
| *Plagioscion squamosissimus* | corvina | 61/53 | 1 | N | *Contracaecum* sp. 1 (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 14 | N | *Hysterothylacium* sp. (if) of Moravec, Kohn and Fernandes, 1993 |
| | | | 1 | N | *Ichthyouris brasiliensis* Moravec, Kohn and Fernandes, 1992 |
| | | | 5 | N | *Paracamallanus amazonensis* Ferraz and Thatcher, 1992 (new host record) |
| | | | 22 | D | *Austrodiplostomum compactum* Lutz, 1928 (mc) |
| | | | 1 | D | *Genarchella astyanactis* (Watson, 1976) (new host record and first report in South America) |
| | | | 1 | C | Cestoda gen. sp. (if) |
| | | | 9 | M | Monogenea gen. sp. |
| **Sternopygidae** | | | | | |
| *Eigenmania virescens* | tuvira | 5/1 | 1 | M | Monogenea gen. sp. |
| *Sternopygus macrurus* | sarapó, tuvira | 1/1 | 1 | C | Cestoda gen. sp. |

**TABLE 2.** List of freshwater fishes not parasitized recorded in reservoir of the Hydroelectric Power Station of Itaipu, Parana, Brazil.

| FISHES | COMMON NAME | N |
|---|---|---|
| **Anostomidae** | | |
| *Leporinus* sp. | piau, piava | 10 |
| *Schizodon altoparanae* | piau | 4 |
| *Schizodon nasutus* | piau, timborê | 1 |
| **Auchenipteridae** | | |
| *Ageneiosus inermis* [=*A. brevifilis*] | perna de moça | 1 |
| *Ageneiosus ucayalensis* | mandubé, mandi-leiteiro | 1 |
| **Callichthyidae** | | |
| *Callichthys callichthys* | cascudinho, tamoatá | 1 |
| **Characidae** | | |
| *Moenkhausia intermedia* | viuvinha | 2 |
| **Cichlidae** | | |
| *Oreochromis niloticus niloticus* | tilápia | 1 |
| *Tilapia rendalli* | tilápia | 1 |
| **Curimatidae** | | |
| *Curimata* sp. | papa-terra | 1 |
| **Doradidae** | | |
| *Rhinodoras dorbignyi* | armado | 1 |
| **Gymonotidae** | | |
| *Gymnotus carapo* | sarapó, morenita | 1 |
| **Loricariidae** | | |
| *Ancistrus cirrhosus* | cascudo-roseta | 2 |
| *Hypostomus luteomaculatus* | cascudo-amarelo | 2 |
| *Hypostomus margaritifer* | cascudo | 1 |
| *Hypostomus* sp. 3 | cascudo-tarzã | 5 |
| **Parodontidae** | | |
| *Parodon tortuosus* | canivete | 6 |
| **Pimelodidae** | | |
| *Pimelodus fur* | mandi-prata | 1 |
| **Rivulidae** | | |
| *Rivulus* sp. | charuto | 1 |
| **Sternopygidae** | | |
| *Eigenmannia trilineata* | tuvira | 1 |

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